(12) UK Patent Application (19) GB (11) 2 261 965 (13) A

(43) Date of A publication 02.06.1993

(21) Application No 9224681.8

(22) Date of filing 25.11.1992

(30) Priority data
(31) 03106552 (32) 29.11.1991 (33) JP

(71) Applicant
Toyotomi Co Ltd

(Incorporated in Japan)

5-17 Momozono-cho, Mizuho-ku, Nagoya-shi, Aichi-ken, Japan

(72) Inventor
Osamu Niwa

(74) Agent and/or Address for Service
Gee and Co
Chancery House, Chancery Lane, London, WC2A 1QU, United Kingdom

(51) INT CL[5]
F23N 1/00

(52) UK CL (Edition L)
G3N NGCA N287 N387
U1S S1955

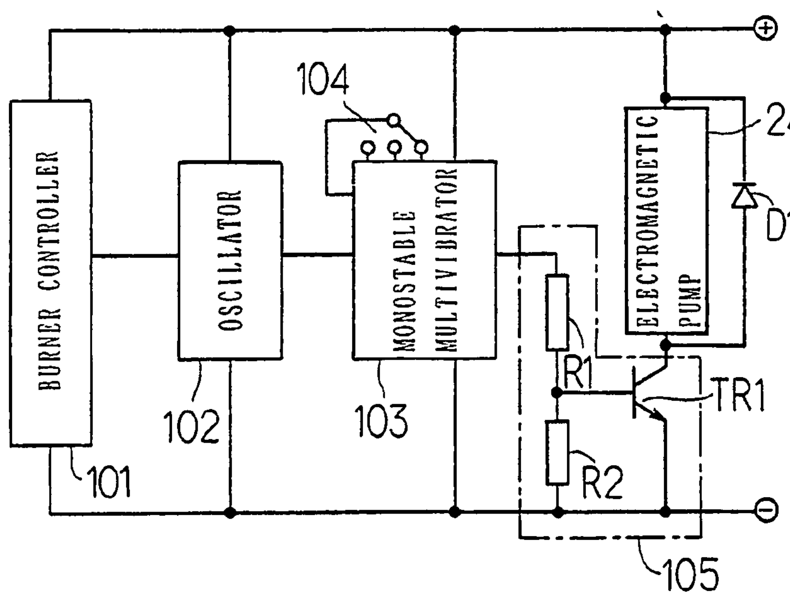
(56) Documents cited
None

(58) Field of search
UK CL (Edition L) G3N NGCA NGE1 NGE1A NGE1B
INT CL[5] F23N 1/00 1/02 1/04 1/06 1/08 1/10
Online databases: WPI

(54) Pot-type oil burner

(57) In a pot-type oil burner the amount of combustion or the fuel feed rate are automatically controlled irrespective of the type of fuel used and/or its viscosity. An oscillator (102) generates an oscillation signal at a frequency selected by a burner controller (101). A monostable multivibrator (103), constituting a turn-on signal generating circuit, is fed with the oscillation signal to generate a turn-on signal in synchronism with the oscillation signal. A transistor (TR1) for permitting an exciting current to flow through an exciting coil of an electromagnetic pump (24) is made conductive depending on the turn-on signal. The monostable multivibrator (103) includes a signal width determining circuit, in which an adjustment element constituted by a resistor and a switch (104) are arranged, so that the switch (104) is closed depending on viscosity of fuel used, to alter the width of the turn-on signal depending on the fuel viscosity.

FIG.2



GB 2 261 965 A

FIG.1

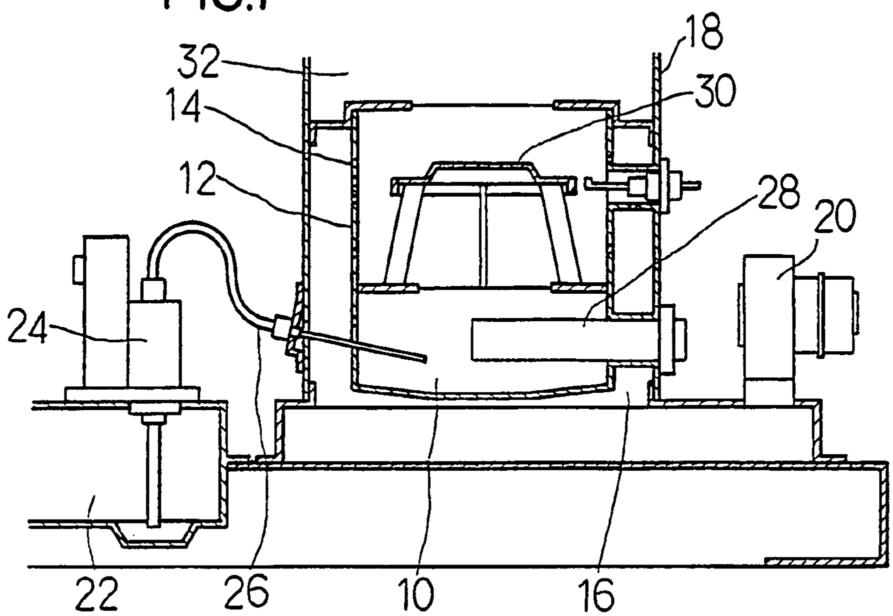

32
18
14
30
12
28
20
24
22
26
10
16

FIG.2

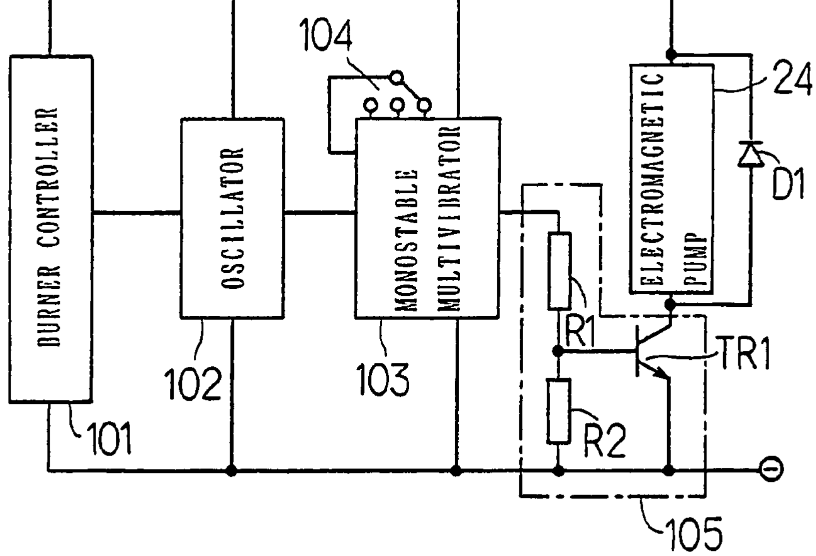
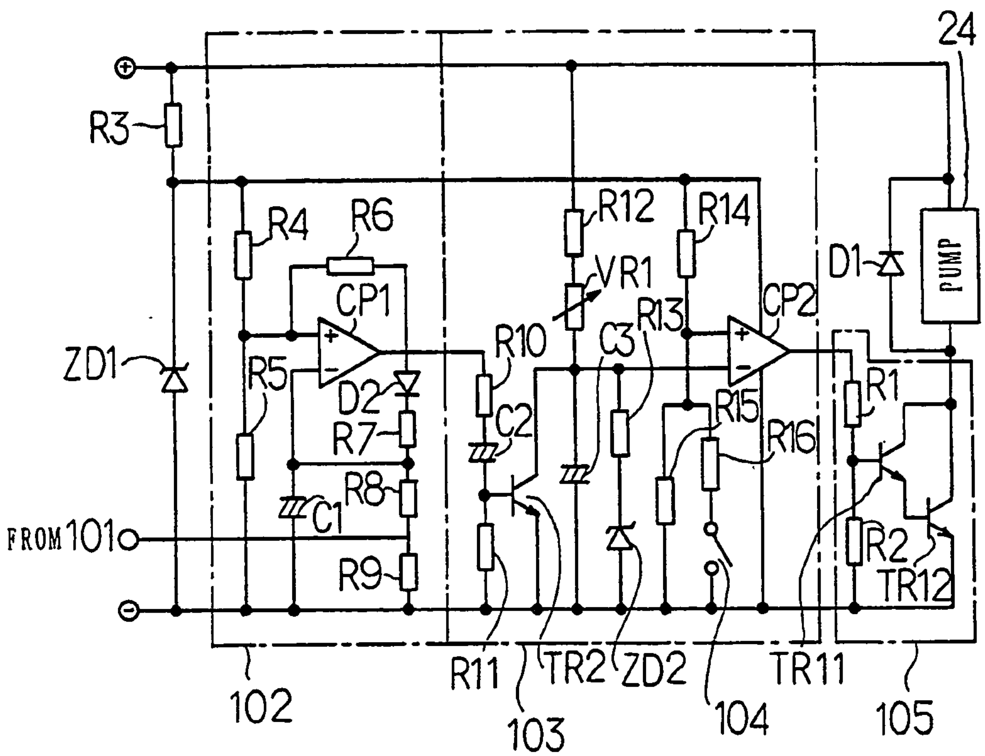

BURNER CONTROLLER
OSCILLATOR
MONOSTABLE MULTIVIBRATOR
ELECTROMAGNETIC PUMP
104
24
D1
R1
TR1
R2
101
102
103
105

FIG.3


24
R3
R4
R6
CP1
R12
R14
VR1
R13
CP2
D1
PUMP
ZD1
R5
D2
R10
C3
R7
C2
R15
R16
R1
R8
C1
FROM 101
R2
R9
TR12
R11
TR2
ZD2
TR11
102
103
104
105

POT-TYPE OIL BURNER

This invention relates to a pot-type oil burner, and more particularly to a pot-type oil burner which is capable of selectively burning any desired one of two or more kinds of fuels different in viscosity such as a desired combination of kerosene, light oil, waste oil, that of kerosene and light oil, that of kerosene and waste oil, and the like.

In general, a pot-type oil burner generally includes a pot arranged in an air passage defined in a burner body, fed with combustion air, and adapted to carry out vaporization of fuel, mixing of the vaporized fuel with air to prepare a mixture and combustion of the mixture; an electromagnetic pump adapted to feed fuel from a fuel reservoir through a fuel feed pipe to the pot; and a pump control device including turn-on signal generating means for generating a turn-on signal at a selected frequency and a switching circuit connected to an exciting coil of the electromagnetic pump and adapted to repeat a switching operation depending on the turn-on signal to feed the exciting coil with an exciting current. The pump control device also includes means for altering a frequency of the turn-on signal, and the amount of combustion is controlled by varying the frequency of the turn-on signal by means of a burner controller and controlling the amount of fuel fed to the pot by means of the electromagnetic pump. The pot-type oil burner thus constructed permits fuels different in viscosity from each other to be selectively burned. Further, the burner permits kerosene to be initially used to carry out ignition and render combustion stable, and then light oil to be substituted for the kerosene for continuing combustion.

Kerosene, light oil and waste oil are different in viscosity from each other. Therefore, even when an oil controller for controlling the amount of oil to be fed to the pot is set to a certain level, the amount of combustion is varied

depending on the type of oil used. Thus, an operation of the pot-type oil burner by a user who is unfamiliar with handling of the burner often causes incomplete combustion, leading to danger. Such a trouble tends to occur after replacement between fuels different in viscosity is carried out or when two or more fuels different in viscosity are concurrently used. In order to avoid such a problem, it is required that a user adjusts the amount of combustion while viewing the combustion whenever the replacement takes place, thus, the conventional pot-type oil burner is dangerous and highly troublesome in handling.

The conventional pot-type oil burner is often constructed so as to permit the amount of combustion or a fuel feed rate to be automatically controlled. For this purpose, the frequency of the turn-on signal of the pump control device is automatically varied according to control data preset with respect to specific fuel used. Unfortunately, this requires preparation of control data depending on viscosity of fuel used and an intended combination between fuels, resulting in the pump control device being highly complicated.

The present invention is intended to overcome the foregoing disadvantages of the prior art.

Accordingly, it is an object of the present invention to provide a pot-type burner which is capable of eliminating the above-described disadvantages of the prior art while ensuring control of the amount of combusion, and therefore the fuel feed rate, in substantially the same manner as the prior art.

It is another object of the present invention to provide a pot-type oil burner which is capable of automatically controlling the amount of combustion or a fuel feed rate by means of less control data, irrespective of the type of fuel used and/or its viscosity.

It is a further object of the present invention to provide a pot-type oil burner which is capable of accomplishing the above-described object while avoiding the complication of the burner.

In accordance with the present invention, a pot-type oil burner is provided which generally includes a burner body provided therein with an air passage, a pot arranged in the air passage for carrying out vaporization, mixing and combustion of fuel fed thereto, a fuel reservoir, a fuel feed pipe arranged between the pot and the fuel reservoir, an electromagnetic pump for feeding fuel from the fuel reservoir through the fuel feed pipe to the pot, which electromagnetic pump includes an exciting coil, and a pump control device including turn-on signal generating means for generating a turn-on signal at a selected frequency and a switching circuit connected to the exciting coil and adapted to repeat a switching operation depending on the turn-on signal to feed the exciting coil with an exciting current.

In the pot-type oil burner generally constructed as described above, the turn-on signal generating means includes an adjustment element adjustable depending on fuel viscosity. The turn-on signal generating means is so constructed that when the adjustment element is adjusted depending on viscosity of fuel used, the signal width of the turn-on signal is appropriately varied in correspondence to the viscosity.

Discharge of fuel through a cylinder of the electromagnetic pump becomes harder with increase in viscosity of fuel used. Therefore, when fuel of high viscosity is used, flow of an exciting current through the exciting coil for the same period of time as in use of fuel of low viscosity fails to fully discharge the fuel from the cylinder of the electromagnetic pump. In view of such a problem, the arrangement of the present invention is such that adjustment by the adjustment element such as a switch or the like permits the signal width of the turn-on signal to be altered depending on the type of fuel used and/or its viscosity. Such construction permits the same amount of fuel to be constantly fed to the pot irrespective of fuel used, thereby ensuring safe combustion by combustion adjustment which is carried out in substantially the same manner as in the prior art. Also,

a pot-type oil burner is often constructed so as to permit the amount of combustion or fuel feed rate to be automatically controlled. The present invention is likewise applied to such construction of the burner; because the present invention permits the same amount of fuel to be fed to the pot irrespective of fuel used, or thereby permits the use of the same control data irrespective of fuel, resulting in automatic control being possible. Thus, the present invention reduces the amount of control data required, to thereby simplify the pump control device.

The turn-on signal generating means of the pump control device can be realized by either hardware or software. When the turn-on signal generating means is realized by hardware, it may include an oscillator for generating an oscillation signal of a selected frequency and a turn-on signal generating circuit which is fed with the oscillation signal and generates the turn-on signal in synchronism with the oscillation signal fed thereto, wherein the turn-on signal generating circuit includes a signal width determining circuit for determining the signal width of the turn-on signal and the adjustment element is incorporated in the signal width determining circuit so as to adjust a time constant of the signal width determining circuit. The frequency of the oscillator is adjusted by a burner controller. When it is automatically adjusted, control data are set in the burner controller, so that the frequency is automatically adjusted according to the control data. For example, the control data are set so as to increase the frequency when the amount of combustion is at a low level as in ignition and decrease it when the amount is at a high level as in combustion. The control data may include data on conditions of transfer from an ignition stage to a combustion stage, data for keeping a temperature constant, and the like.

The turn-on signal generating circuit may comprise a monostable multivibrator capable of adjusting a signal width of the turn-on signal, wherein the adjustment element includes a manual switch which is arranged in the signal width determining

circuit of the monostable multivibrator to adjust impedance of the signal width determining circuit. A monostable multivibrator is suitable for use for the turn-on signal generating circuit, because it is inexpensive and readily adjusts signal width of the turn-on signal.

When the turn-on signal generating means is realized by software, it may comprise a microcomputer driven according to a predetermined program, wherein the adjustment element comprises a condition setting switch for altering initial conditions of the program. The predetermined program may comprise a reference signal generating routine for realizing reference signal generating means for generating a reference signal every time a predetermined number of reference clock pulses are counted, and a turn-on signal generating routine for generating a signal continuing from generation of the reference signal to counting of the predetermined number of reference clock pulses to feed the switching circuit with the continuing signal as the turn-on signal, whereby the condition setting switch causes the predetermined count number of the turn-on signal generating routine to be altered. Depending on viscosity of fuel used, the condition setting switch functioning as the adjustment element alters the predetermined count number of the turn-on signal generating routine.

Alternatively, the predetermined program may comprise a reference signal generating routine for realizing reference signal generating means which generates a reference signal when a predetermined number of reference clock pulses are counted after a reset signal is fed thereto, and a turn-on signal generating routine for generating a signal continuing from generation of the reference signal to counting of the predetermined number of reference clock pulses to feed the switching circuit with the continuing signal as the turn-on signal and then generating the reset signal when the predetermined number of reference clock pulses are counted, whereby the condition setting switch causes the predetermined count number of the turn-on signal generating routine to be altered. Likewise, depending on viscosity of fuel

used, the condition setting switch functioning as the adjustment element alters the predetermined count number of the turn-on signal generating routine. The program causes the frequency of the reference signal to be somewhat varied; however, the program itself is simplified. Some variation in frequency of the reference signal does not substantially affect the advantages of the present invention.

These and other objects and many of the attendant advantages of the present invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings; wherein:

Fig. 1 is a schematic vertical sectional view showing an embodiment of a pot-type oil burner according to the present invention;

Fig. 2 is a schematic diagrammatic view showing a pump control device incorporated in the pot-type oil burner shown in Fig. 1; and

Fig. 3 is a circuit diagram showing an example of a circuit for the pump control device shown in Fig. 2.

Referring first to Fig. 1, a general construction of an embodiment of a pot-type oil burner according to the present invention is shown. A pot-type oil burner of the illustrated embodiment may be constructed in substantially the same manner as a conventional pot-type oil burner, except for a pump control device which will be described in detail hereinafter. The pot-type oil burner of the illustrated embodiment includes a cylindrical pot 10 of which a side wall 12 is formed with a number of small through-holes 14. The cylindrical pot 10 is arranged in an air

passage 16 defined in a burner body 18 so that the side wall 12 of the pot 10 and its bottom wall are surrounded with the passage 16. The air passage 16 is communicated with an air fan 12, which is adapted to forcibly feed combustion air through the air passage 16 to the pot 10. The pot-type oil burner also includes an oil reservoir 22 mounted on the burner body 18 and an electromagnetic pump 24 mounted on the oil reservoir 22 in a manner to communicate therewith. Between the electromagnetic pump 24 and the pot 10 is arranged a fuel feed pipe 26 so as to communicate the electromagnetic pump 24 and pot 10 with each other therethrough, so that actuation of the electromagnetic pump 24 may permit fuel oil to be forcibly fed from the oil reservoir 22 through the fuel feed pipe 26 to the pot 10. In the illustrated embodiment, the fuel feed pipe 26 is arranged in a manner to extend at one end thereof into the oil reservoir 22 and at the other end thereof into the pot 10, so that the electromagnetic pump 24 is arranged on an intermediate portion of the fuel feed pipe 26.

The pot-type oil burner of the illustrated embodiment further includes a preheating and igniting heater 28 arranged in the pot 10 in a manner to be positioned in proximity to the bottom wall of the pot 10. Also, the pot 10 is provided therein with a combustion member 30 so as to be positioned above the heater 28. The combustion member 30 functions to fully mix fuel gas evaporated near the bottom of the pot 10 with air fed from the air passage 16 via the small through-holes 14 into the pot to form combustible gas, to thereby permit the combustible gas to be subject to complete combustion in a combustion chamber 32 defined above the pot 10 in the burner body 18.

Referring now to Fig. 2, an example wherein a control device for the electromagnetic pump 24 is realized by means of hardware is schematically shown. The pump control device includes a burner controller 101 which is constituted by a timer element, various sensors, a microcomputer for control and the like and functions to generate a combustion quantity signal for determining the amount of combustion or a fuel feed rate

according to an operation command by an operator. The burner controller 101 alters the combustion quantity signal depending on the amount of operation of a control knob when manual adjustment is carried out; whereas when automatic adjustment is carried out, the burner controller 101 automatically varies the combustion quantity signal according to the control data set. Reference numeral 102 designates an oscillator of which the oscillation frequency is varied depending on the combustion quantity signal. The oscillator 102 generates an oscillation signal, which is then fed to an input terminal of a monostable multivibrator 103 used as a turn-on signal generating circuit.

The monostable multivibrator 103 includes a signal width determining circuit for determining a signal width of a turn-on signal which is a signal generated from the monostable multivibrator 103 and a switch 104 connected thereto so as to adjust a time constant of the signal width determining circuit to adjust a signal width of the turn-on signal. For example, when the switch 104 is changed over in three stages as in the example shown in Fig. 2, the stages may be allocated to kerosene, light oil and waste oil, respectively. Alternatively, the stages may be assigned to degrees of viscosity of fuel used different from each other such as, for example, low, middle and high viscosity coefficients, respectively. In any cases, the allocation of changing-over stages of the switch 104 is carried out so that the signal width of the turn-on signal may be increased with an increase in viscosity of fuel used. The pot-type oil burner may be adapted to use only a single kind of fuel in each combustion operation. In this instance, changing-over of the switch 104 is carried out depending on viscosity of fuel newly charged in the oil reservoir 22 due to replacement of fuel. When the burner is adapted to replaceably or selectively use any one of two or more kinds of fuels concurrently charged in the burner, the switch 104 is changed over in association with replacement between the fuels. When replacement between the fuels is automatically carried out, the switch 104 is automatically changed over in assocation with the automatic replacement.

The turn-on signal generated by the monostable multivibrator 103 is then fed to a switching circuit 105, which includes a drive circuit comprising resistors R1 and R2 and a transistor TR1 which is a kind of semiconductor switching element. An emitter-collector circuit of the transistor TR1 is connected in series to the exciting coil of the electromagnetic pump 24, so that an exciting current flows through the exciting coil of the electromagnetic pump 24 for a period of time during which the transistor TR1 is kept conductive. During the period, a piston of the electromagnetic pump 24 is forcibly maintained at a position which permits fuel to be discharged. Connected in parallel to the exciting coil of the electromagnetic pump 24 is a diode D1, which comprises a flywheel diode.

In the illustrated embodiment, the oscillator 102 and monostable multivibrator 103 cooperate with each other to constitute turn-on signal generating means.

Supposing that the switch 104 is kept set at a position at which kerosene is permitted to be used as fuel for the burner; when it is desired to use light oil as the fuel, the switch 104 is set to a position which permits use of light oil. This results in a signal width of the turn-on signal generated from the monostable multivibrator 103 being increased in correspondence to an increase in viscosity of fuel due to selection of light oil, so that the electromagnetic pump 24 may positively discharge the fuel or light oil through a cylinder thereof irrespective of an increase in viscosity. Thus, even when a frequency of the oscillator 102 is set as in use of kerosene as the fuel, substantially the same amount of combustion as in kerosene can be obtained. When kerosene is used for ignition and light oil is used only for combustion, an appropriate amount of combustion is likewise obtained by merely changing over the switch 104 in association with replacement of the fuels.

Referring now to Fig. 3, an example of a circuit construction for the pump control device shown in Fig. 2 is shown. Like reference characters used through Figs. 2 and 3

designate like parts, and the parts which have been described with reference to Fig. 2 will be substantially deleted from the following description in connection with Fig. 3 for the sake of brevity. Also, in the circuit shown in Fig. 3, the burner controller 101 is deleted, the switch 104 is adapted to carry out changing-over in a single stage, and the switching circuit 105 includes two transistors TR1 and TR2 connected together by Darlington connection. A resistor R3 and a Zener diode ZD1 cooperate with each other to form a constant-voltage circuit.

Now, the manner of operation of the oscillator 102 will be described with reference to Fig. 3. When a voltage across a capacitor C1 connected to a negative input terminal of a comparator CP1 comprising an IC is low as compared with a voltage applied to a positive input terminal of the comparator CP1, an output of the comparator CP1 is rendered high and the output of the comparator CP1 thus increased causes the capacitor CP1 to be charged through a diode D2 and a resistor R7. When the voltage across the capacitor C1 is increased to a level above the voltage applied to the positive input terminal of the comparator CP1, the output of the comparator CP1 is rendered low, so that discharge of the capacitor C1 is carried out through resistors R8 and R9. Then, such an operation is repeated, so that an oscillation signal may be fed from the oscillator 102 to an input terminal of the monostable multivibrator 103. To both ends of the resistor R9 is connected an output (variable impedance) of the burner controller 101 in parallel, so that a variation in impedance of the output of the burner controller 101 causes a variation in impedance of a discharge circuit for the capacitor C1, leading to a variation in oscillation frequency.

Also, the manner of operation of the monostable multivibrator 103 will be described now. When the output of the oscillator 102 is kept low, a capacitor C3 is charged through a resistor R12 and a variable resistor VR1. A voltage across the capacitor C3 is restricted by a Zener voltage of a Zener diode ZD2. When the output of the oscillator 102 is rendered high, a differential signal of the oscillation signal of the oscillator

102 which has been differentiated by a differentiating circuit comprising a resistor R10, a capacitor C2 and a resistor R11 is fed to a base of a transistor TR2, so that the transistor TR2 is rendered conductive instantaneously, leading to discharge of the capacitor C3. The voltage across the capacitor C3 is applied to a negative input terminal of a comparator CP2. To a positive input terminal of the comparator CP2 is fed a dividing voltage of a divider circuit comprising resistors R14 and R15. The divider circuit comprises resistors R14, R15 and R16 when the switch 104 is closed. An output of the comparator CP2 is kept high; until the transistor TR2 is rendered non-conductive to cause charging of the capacitor C3 to be started, so that the voltage across the capacitor C3 reaches a level of the voltage applied to the positive input terminal of the comparator CP2. When the voltage across the capacitor C3 exceeds the voltage applied to the positive input terminal of the comparator CP2, the output of the comparator CP2 is rendered low, resulting in being kept low until the transistor TR2 is rendered conductive again. A variation in voltage applied to the positive input terminal of the comparator CP2 permits a signal width of the turn-on signal generated by the monostable multivibrator 103 to be varied. In the example shown in Fig. 3, when the switch 104 is closed, the resistor R16 is caused to be connected in parallel to the resistor R15. This causes a voltage applied to an input terminal of the comparator CP2 to be reduced, to thereby decrease the signal width of the turn-on signal. In order to close the switch 104 to increase the signal width of the turn-on signal, it is merely required to connect a series circuit of a resistor R16 and the switch 104 in parallel to the resistor R14. Also, when the switch 104 is constructed so as to be changed over in three stage as in the embodiment shown in Fig. 2, two series circuits each comprising the resistor and switch are connected in parallel to the resistor R14 or R15. In the illustrated embodiment, the resistors R14, R15 and R16 and switch 104 cooperate together to form a signal width determining circuit, and the resistor R16 and switch 104 constitute an adjustment element for adjusting a signal width of

the turn-on signal. The series circuit constituted by the resistor R16 and switch 104 may be replaced with a circuit including an element capable of varying impedance such as a variable resistor or the like.

In the illustrated embodiment, a main part of the pump control device is constituted by hardware. Alternatively, the turn-on signal generating means constituted by the oscillator 102 and monostable multivibrator 103 may be realized by software using a microcomputer. A program used for realizing the turn-on signal generating means by means of a microcomputer may include, for example, a reference signal generating routine for realizing reference signal generating means which generates a reference signal every time when a predetermined number of reference clock pulses are counted and a turn-on signal generating routine for feeding the switching circuit 105 with a signal continuing from generation of the reference signal to counting of the predetermined number of reference clock pulses as the turn-on signal. According to the program thus prepared, it is possible to alter the predetermined count number of the turn-on signal generating routine using a condition setting switch, to thereby adjust a width of the turn-on signal. The program may be prepared in a more simplified manner. For this purpose, the reference signal generating means realized by the reference signal generating routine is constructed so as to generate the reference signal when the predetermined number of reference clock pulses are counted after a reset signal is input thereto, and the turn-on signal generating routine is constructed so as to feed the switching circuit 105 with a signal continuing until the predetermined number of reference clock pulses are counted after the reference signal is generated as the turn-on signal and then generate the reset signal when the predetermined number of reference clock pulses are counted. In this instance, a signal width of the turn-on signal may be adjusted by altering the predetermined count number by the condition setting switch.

The program used realizing the turn-on signal generating means by means of a microcomputer is not limited to the

foregoing.

While a preferred embodiment of the invention have been described with a certain degree of particularity with reference to the drawings, obvious modifications and variations are possible in light of the above teachings. It is therefore to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described.

CLAIMS:

1. A pot-type oil burner comprising:

a burner body provided therein with an air passage;

a pot arranged in said air passage for carrying out vaporization, mixing and combustion of fuel fed thereto;

a fuel reservoir;

a fuel feed pipe arranged between said pot and said fuel reservoir;

an electromagnetic pump for feeding fuel from said fuel reservoir through said fuel feed pipe to said pot, said electromagnetic pump including an exciting coil; and

a pump control device including turn-on signal generating means for generating a turn-on signal at a selected frequency and a switching circuit connected to said exciting coil and adapted to repeat a switching operation depending on said turn-on signal to feed said exciting coil with an exciting current, characterized in that said turn-on signal generating means includes an adjustment element adjustable depending on fuel viscosity; and said turn-on signal generating means is so constructed that when said adjustment element is adjusted depending on the viscosity of fuel used, the signal width of said turn-on signal is appropriately varied in correspondence with the viscosity.

2. A pot-type oil burner as claimed in Claim 1, wherein said turn-on signal generating means comprises:

an oscillator for generating an oscillation signal of a selected frequency; and

a turn-on signal generating circuit which is fed with said oscillation signal and generates said turn-on signal in synchronism with said oscillation signal fed thereto, said turn-on signal generating circuit including a signal width determining circuit for determining said signal width of said turn-on signal, and said adjustment element being incorporated in said signal width determining circuit so as to adjust the time constant of said signal width determining circuit.

3. A pot-type oil burner as claimed in Claim 2, wherein said turn-on signal generating circuit comprises a monostable multivibrator capable of adjusting said signal width of said turn-on signal, said adjustment element including a manual switch which is arranged in said signal width determining circuit of said monostable multivibrator to adjust the impedance of said signal width determining circuit.

4. A pot-type oil burner as claimed in Claim 1, wherein said turn-on signal generating means comprises a microcomputer driven according to a predetermined program and said adjustment element comprises a condition setting switch for altering initial conditions of said program.

5. A pot-type oil burner as claimed in Claim 4, wherein said predetermined program comprises:

a reference signal generating routine for realizing reference signal generating means for generating a reference signal every time when a predetermined number of reference clock pulses are counted; and

a turn-on signal generating routine for generating a signal continuing from generation of said reference signal to counting of said predetermined number of reference clock pulses to feed said switching circuit with said continuing signal as said turn-on signal, whereby said condition setting switch causes said predetermined count number of said turn-on signal generating routine to be altered.

6. A pot-type oil burner as defined in Claim 4, wherein said predetermined program comprises:

a reference signal generating routine for realizing reference signal generating means which generates a reference signal when a predetermined number of reference clock pulses are counted after a reset signal is fed thereto;

a turn-on signal generating routine for generating a signal continuing from generation of said reference signal to counting of said predetermined number of reference clock pulses to feed said switching circuit with said continuing signal as said turn-on signal and then generating said reset signal when said predetermined number of reference clock

pulses are counted, whereby said condition setting switch causes said predetermined count number of said turn-on signal generating routine to be altered.

7. A pot-type oil burner as claimed in any preceding claim, wherein said pump control device further includes a controller for automatically altering the frequency of said turn-on signal to automatically control the amount of combustion.

8. A pot-type oil burner as claimed in claim 1 and substantially as hereinbefore described.

9. A pot-type oil burner substantially as hereinbefore described with reference to the accompanying drawing.

10. A pump control device as defined in any preceding claim.

11. The features herein described, or their equivalents, in any patentably novel selection.

17

Patents Act 1977
Examiner's report to the Comptroller under S' 'tion 17 (The Search Report)

Application number

GB 9224681.8

Relevant Technical fields

(i) UK Cl (Edition L) G3N (NGCA, NGE1, NGE1A, NGE1B)

(ii) Int Cl (Edition 5) F23N (1/00, 1/02, 1/04, 1/06, 1/08, 1/10)

Databases (see over)

(i) UK Patent Office

(ii) WPI

Search Examiner

MR D A SIMPSON

Date of Search

27 JANUARY 1993

Documents considered relevant following a search in respect of claims 1 TO 9

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
	NONE	

Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family, corresponding document.

Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).

Published 1993 at The Patent Office, Concept House, Cardiff Road, Newport, Gwent NP9 1RH. Further copies may be obtained from Sales Branch, Unit 6, Nine Mile Point, Cwmfelinfach, Cross Keys, Newport, NP1 7HZ. Printed by Multiplex techniques ltd, St Mary Cray, Kent.